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Petrophysical Evaluation of Pliocene Reservoirs at West Nile Delta, Egypt

THESIS

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Note

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Beside the research work materialized in this thesis, the candidate has attended ten post-graduate courses for one year in the following topics:

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DEDICATION

This work is dedicated

*To **Allah** and I hope to accept it from me*

*To my **parents***

*To my **brother***

*To my **husband***

To my son
Yasseen

ABSTRACT

The offshore Nile Delta basin is considered as one of the most promising province in Egypt which has an excellent potential gas and condensate reserves for future exploration, West Med Block 1 lies offshore on the western side of the Nile Delta. It is between 20 and 100 km from the coast and the city of Alexandria and lies in water depths from 250 m (800 ft) in the southeast to over 1200 m (3800 ft) in the northwest.

The aim of this study is directed to evaluate the Kafr Elsheikh reservoir Formation using pretrophysical analysis through determine the different reservoir parameters characterizing the pay zone from well log data to spot light on the promising locations for other further exploration. In addition develop litho-saturation cross plots and the lithologic identification cross plots, introducing the lateral variation of the lithology and the different saturation distribution in the reservoir rock. The available data include logging data of seven representative wells, for the purpose of evaluation the of Kafr Elshikh reservoir.

Petrophysical data are illustrated on Iso-parametric maps (total thickness, total porosity, effective porosity, water saturation, shale volume, net sand, net growth sand, net pay and hydrocarbon saturation, residual hydrocarbon saturation and movable hydrocarbon saturation) to indicate the lateral variation, good places for new productive wells, and to represent the reservoir thickness. Moreover deducing some of the factors responsible for the drying or absence of gas productivity of all wells drilled in the study area, and introduces some recommendations related to these conditions of reservoirs.

From the results, it can be stated that the study area may be considered containing hydrocarbon accumulation in different locations, and

there is a good opportunity to drill other development wells to enhance the productivity from the area of study.

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LIST OF ABBREVIATIONS

Word	Abbreviations
Feet……..	ft
resistivity of flushed zone ……..	Rxo
Microspherically Focused Log.....	MSFL
Deep resistivity …….	RLLD
Water resistivity …….	Rw
Surface temperature…….....	ST
Total depth ……	TD
Bottom hole temperature……	BHT
Formation depth……..	FD
Flushed zone resistivity…….	Rxo
Uninvaded zone resistivity……..	RT
Thickness of mud cake……...	hmc
Formation resistivity factor……	F
Porosity derived from a measurement of formation density…...	ΦD
Matrix density…….	ρma
Density log reading…….	ρblog
Fluid density……..	ρbf
Density of shale bed……	ρbsh
Gamma ray log for clean formation……	GRcl
Gamma ray log for shale…….	GRsh
Mediterranean…….	med

Chapter One

INTRODUCTION

The West Delta deep marine concession lies 20–100 km offshore in the deep water of the present-day Nile Delta, covering 6150 km^2 of the northwestern margin of the Nile cone. Recent exploration activity has focused on the Pliocene, with 13 consecutive exploration and appraisal wells successfully drilled on nine separate fields since BG Group and partner Edison Gas acquired the concession in 1995. Burullus Gas, a subsidiary of Rashpetco currently operates the concession on behalf of the Egyptian General Petroleum Gas corporation, BG Group, and Edison Gas.

The Nile Delta, Mediterranean, drilling provinces occur within a petroleum system dominated by play trends involving Pliocene turbidities fans and channels, deformation of Pliocene deltaic sandstone, Messinian valley fills, and older Miocene turbidity deposits. Most current activity is located in the offshore Mediterranean.

The Nile Delta consists of a thick, northerly prograding clastic wedge of dominantly Neogene age. Throughout the Neogene, a Deepwater slope and/or basin floor environment was prevalent over West Med Block 1 with sediment dispersal from the Rosetta arm of the Nile Delta intermittently adding coarse sediment to an otherwise fines-dominated slope and basin floor system in the form of sheet turbidities and slope channel-levee complexes.

Shallow marine sandstones were deposited prior to a set of thin anhydrite beds. Sedimentation then rapidly returned to the deep marine setting. An earlier similar sea level fall and high salinity event may have occurred during the Serrivalian/Burdigalian.